



An Equivalent Source Method for Modelling the Lithospheric Magnetic Field Using Satellite and Airborne Magnetic Data

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GP31B-02 An Equivalent Source Method for Modelling the Lithospheric Magnetic Field Using Satellite and Airborne Magnetic Data[Back to:](#)[Christopher Finlay](#)

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We present a technique for modelling the lithospheric magnetic field based on estimation of equivalent potential field sources. As a first demonstration we present an application to magnetic field measurements made by the CHAMP satellite during the period 2009-2010. Three component vector field data are utilized at all latitudes. Estimates of core and large-scale magnetospheric sources are removed from the satellite measurements using the CHAOS-4 model. Quiet-time and night-side data selection criteria are also employed to minimize the influence of the ionospheric field. The model for the remaining lithospheric magnetic field consists of magnetic point sources (monopoles) arranged in an icosahedron grid with an increasing grid resolution towards the airborne survey area. The corresponding source values are estimated using an iteratively reweighted least squares algorithm that includes model regularization (either quadratic or maximum entropy) and Huber weighting. Data error covariance matrices are implemented, accounting for the dependence of data error variances on quasi-dipole latitudes. Results show good consistency with the CM5 and MF7 models for spherical harmonic degrees up to $n = 95$. Advantages of the equivalent source method include its local nature and the ease of transforming to spherical harmonics when needed. The method can also be applied in local, high resolution, investigations of the lithospheric magnetic field, for example where suitable aeromagnetic data is available. To illustrate this possibility, we present preliminary results from a case study combining satellite measurements and local airborne scalar magnetic measurements of the Norwegian coastline.

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